REMARKS

The present invention relates to an adaptive antenna-matching network for wireless communications devices. Conventional antenna tuning units (ATU) typically initiate an antenna tuning procedure only after a change in operating frequency. During the tuning phase, the ATU searches for the lowest Voltage Standing Wave Ratio (VSWR), and tunes the antenna to the transmitter accordingly. However, once tuned, conventional ATUs will not re-tune the antenna to the transmitter until the next change in frequency. Thus, conventional ATUs do not consider impedance mismatches that may occur between the antenna and the transmitter while the transmitter operates at the selected frequency. The present invention solves this problem with a low-cost adaptive antenna-matching network that quasi-continuously re-tunes the antenna to the transmitter while the transmitter is operating at the selected frequency.

Applicant respectfully traverses the rejection to claim 34 under 35 U.S.C. § 102(b) as being anticipated by Sroka. Claim 34 requires "an impedance mismatch measuring and quantizing unit connected in the transmit signal path between the selected transmit power amplifier and the variable matching network, the impedance mismatch measuring and quantizing unit measuring forward and reflected power of a signal transmitted on the selected transmit frequency band, and generating mismatch indication signals providing a quantized indication of antenna impedance mismatch, the impedance mismatch measuring and quantizing unit generating the mismatch indication signals during the transmit time slot of the TDMA frame period." The patent to Sroka in contrast, teaches measuring reflected power and making matching adjustments during an idle period of a TDMA frame. As such, Sroka fails to anticipate claim 34 under § 102.

Sroka discloses an adaptive antenna matching unit for a mobile terminal. Although the Sroka patent discloses measuring forward and reflected power, it does not disclose any means to measure the reflection coefficient phase. Column 3 of Sroka, line 42 – column 4, line 9, reveals that the forward power and the reflected power detectors are the same, and provide an

indication of the forward and reflected power to a processor. The processor then calculates a power reflection coefficient based on these values. However, the calculated power reflection coefficient is a scalar quantity, not a reflection coefficient phase. Because of this, the device of Sroka has no clue in which direction to make a matching adjustment. Therefore, Sroka must use a trial-and-error method, which is described in column 6, line 37 – column 7, line 22.

The trial-and-error method of Sroka, however, produces an undesirable effect. That is, without knowing in which direction to make an adjustment, it can make the mismatch worse before it gets better. Applicant respectfully directs the Examiner's attention to column 6 of Sroka, lines 36-39. "It will be appreciated that some modification may actually make matters worse but, over the course of the adaptation algorithm, better. . .values shall be identified." Thus, Sroka discloses effecting the adaptation algorithm during the idle period of the TDMA frame to help mitigate this effect. "In a preferred embodiment, adaptations are made during idle periods, so that impedance values which result in a mismatch being made worse will not actually affect transmission." However, given the trial-and-error method of Sroka, the only way not to impair transmission characteristics is for Sroka to activate the transmitter to measure the forward and reflected power during the idle period of the TDMA frame. A further indication of this appears in column 5, line 66 – column 6, line 4, in which Sroka specifically teaches transmitting a signal with a low power output to reduce battery power drain. This clearly indicates that Sroka activates the transmitter outside the allocated transmit time slot (i.e., during the idle period) to measure the antenna mismatch, perform trial and error adaptation, and thus, have a corrected impedance mismatch before the next transmission time slot.

This is not the invention of claim 34. First, claim 34 explicitly requires that "the impedance mismatch measuring and quantizing unit generating the mismatch indication signals during the transmit time slot of the TDMA frame period." As stated above, Sroka teaches activating the transmitter to measure mismatch and perform trial-and-error adaptation during the idle period of the TDMA frame. Indeed, the device of Sroka is not even permitted by most

cellular standards, in which the present invention is conceived to operate. That is, one user's idle slot is another's transmit slot. Many cellular standards do not permit the "test transmissions" of Sroka during the idle period because they would necessarily interfere with these other users. Second, claim 34 requires "the impedance mismatch measuring and quantizing unit [to generate]. . .mismatch indication signals." These mismatch indication signals provide a coarse indication in which to make the adjustment to the antenna. Thus, claim 34 does not make a "blind guess," as does the device of Sroka. Therefore, Sroka does not anticipate claim 34 as asserted by the Examiner because Sroka fails to teach each and every element of claim 34. Accordingly, Applicant respectfully requests the allowance of claim 34, and its dependent claims 35-40.

The Examiner also rejected claim 41 under 35 U.S.C. § 102(b) as being anticipated by Sroka. However, claim 41 requires "measuring a signal to determine a complex reflection coefficient indicative of a quality of an impedance match between a transceiver and an antenna at a selected frequency band." This provides a coarse indication as to where (i.e., which direction) the adjustment must be made. In other words, Applicant's invention requires knowledge of where to adjust to prior to making an adjustment. As stated above, Sroka does not teach "measuring a signal to determine a complex reflection coefficient." Sroka teaches measuring the forward and reflected power to calculate a scalar quantity. This value, however, provides no indication to the disclosed device of where to adjust to. Rather, it results in the disclosed trial-and-error method of Sroka. Thus, Sroka also fails to anticipate claim 41 under 35 U.S.C. § 102(b). Accoringly, Applicant respectfully request the allowance of claim 41, and its dependent claims 42-51.

Claim 52, also rejected by the Examiner under 35 U.S.C. § 102(b) as being anticipated by Sroka, requires "generating an impedance mismatch signal to a controller during the transmit time slot of the TDMA frame based on the quantized forward power and reflected power." Thus, for the reasons stated above with respect to claim 34, Sroka fails to anticipate claim 52.

Applicant therefore respectfully requests the allowance of claim 52, and its dependent claims 53-62.

The Examiner also rejected claim 63 under 35 U.S.C. § 102(b) as being anticipated by Sroka. Applicant has amended claim 63 to now require the controller to "detect an impedance mismatch between the transceiver and the antenna at the selected frequency band, said impedance mismatch comprising an impedance mismatch signal generated during a transmit time slot of the TDMA frame and based on the quantized forward power and reflected power." Thus, for the reasons stated above with respect to claim 34, the patent to Sroka fails to anticipate claim 63 under § 102(b). Accordingly, Applicant respectfully requests the allowance of claim 63.

Finally, the Examiner rejected claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Sroka in view of Wright. Claim 1 has been amended to correct a minor typographical error. Claim 1 requires, "an adjustable matching network selectively connecting the antenna to a select one of a third plurality of transmit power amplifiers corresponding to the first plurality of transmit frequency bands for signal transmission, the adjustable matching network matching an impedance of the antenna to the select one transmit power amplifier." As stated above, the patent to Sroka adaptively tunes an antenna using a trial-and-error method, and never indicates a need or desire to control the power output of a power amplifier. The patent to Wright discloses using the forward and reflected power indications to control the power output of a power amplifier, but does so in lieu of adaptive tuning procedures. That is, instead of re-tuning the antenna responsive to detected impedance mismatch, the device of Wright merely *compensates* for the impedance mismatch by reducing output power. Thus, it is unclear to Applicant exactly how (or why) one skilled in the art would be led to modify a reference that teaches adaptive tuning procedures with a reference that teaches controlling power output to negate the need for performing adaptive tuning procedures.

With all due respect, the Examiner appears to have made the combination of Sroka and Wright merely because Wright discloses a plurality of amplifiers. However, selecting the teachings of unrelated references simply because they may show all the elements of a claim is not now, and has never been, a *legally sufficient* reason combine. The patent to Sroka never indicates anything regarding a desire to control the power output of a power amplifier. The patent to Wright never indicates anything regarding a desire to adaptively tune an antenna instead of/along with controlling the power output of the amplifier. As such, it appears as though the Examiner's proffered motivation is unsupported by the cited references, and could only have come from Applicant's own invention through impermissible hindsight reconstruction. Accordingly, neither Sroka nor Wright teach or suggest, alone or in combination, claim 1. Therefore, Applicant respectfully requests the allowance of claim 1, and its dependent claims 2-33.

Respectfully submitted,

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